Remarks

The Examiner has rejected Claims 1-15 under 35 U.S.C. 112, second paragraph. Such rejection is respectfully traversed. In response to the Examiner's question regarding Claim 1, an auxiliary system is a system which performs an ancillary or auxiliary function other than vehicle propulsion. This is defined in the broadest sense to include brake systems (that needs engine vacuum to build up booster pressure or vacuum), cabin heating/cooling systems (which indirectly needs the engine to charge the battery to have sufficient energy to power the compressor or to run the compressor directly from the generator or alternator which is running when engine is ON), fuel vapor storage (purge) systems (that needs the engine to periodically ingest vapor from the canister into the intake manifold, to be burnt along with injected fuel). See page 2, line 23 of the specification reproduced below.

> "Ancillary functions that require engine operation include, but are not limited to: brake booster vacuum, fuel vapor purge, and passenger compartment heating or air conditioning. It is an object of the present invention to reduce the number of times that the engine or other main power unit is turned on solely for supporting non-propulsive or ancillary functions to thereby enhance both fuel economy and reduce engine emissions."

With regard to Claim 2, every "window" has upper and lower threshold values which define the window. The "parameter" depends on the auxiliary system, for example the parameter for the brake booster vacuum subsystem is inches of Hg vacuum and for the HVAC system the parameter is temperature. See the discussion of these two examples beginning at page 6, line 3. In the brake booster vacuum subsystem a vacuum of between 10 and 15 inches of Hg is proposed as an example of the window. As claimed in Claim 2 if the engine is ON and the level is less that the upper window threshold 15, then a request is made the engine remain ON notwithstanding the fact that the engine is no longer needed to charge the battery for example. As further claimed in Claim 2 if the engine is OFF and the level is less than 10 a request is made to turn the engine ON until the level is greater than the lower threshold level.

With regard to Claim 3 a "unit ON auxiliary system threshold value" is a threshold value that is associated with an auxiliary system when the power unit i.e. the engine is ON and is SET or established during the program at step 42 when an engine ON condition is detected. Similarly, a "unit OFF auxiliary system threshold value" is a threshold value that is associated with an auxiliary system when the power unit or engine is OFF and is different than the engine ON threshold value. These threshold values are stored and accessed by the computer program commands when needed for comparison with real time values obtained from the appropriate sensor. See discussion of Fig. 2 at page 5 beginning at line 15.

With regard to Claims 5-8, ancillary or auxiliary systems are systems on the vehicle that perform functions that are primarily non-propulsive. See page 2, line 23 reproduced above.

With regards to Claim 9, the steps requesting the engine be maintained ON i.e. the engine is already ON, is the path involving the blocks 42, 44, 48. That is to say, if the engine is ON (40), and the predetermined parameter of ANY of the auxiliary systems is below its threshold (44), as set (42) then the flow is via the NO branch of 44 and the "engine on" flag is SET (48) and therefore the engine ON condition is maintained so that the same loop will be executed until the respective parameters of ALL systems are above their respective "engine on" thresholds at which time the engine ON flag will be cleared (46). Similarly, if the engine is OFF (NO branch of 40) then the engine ON flag will be set (48) to request a unit ON status if any system parameters is below (52) its respective threshold set at 50.

With regards to the Examiner's questions about the control of the auxiliary systems please consider the following remarks. The auxiliary systems are typically under the control of the controller 20 and respond to actions of the operator of the vehicle or sensors on the vehicle which are input commands to the controller. The present invention is concerned with controlling the engine in order to "reduce the number of times that the engine ... is turned on solely for supporting non-propulsive or ancillary functions performed by these auxiliary systems to thereby enhance both fuel economy and reduce engine emissions" (page 2, line 27). The auxiliary systems are not turned ON and OFF by the invention either simultaneously or otherwise. Also, it is the auxiliary system parameter, interior temperature for example, that is compared with a parameter threshold to determine whether the status of the engine should be changed from OFF to ON or maintained ON.

In view of the above remarks it is submitted that Claims 1-15 conform to the requirement of 35 U. S. C. 112.

The Examiner has rejected Claims 1-4 and 9-11 under 35 U.S.C. 103(a) as unpatentable over Brigham et al and Ibaraki et al. Such rejection is respectfully traversed. Brigham is concerned with controlling the ON/OFF status of the engine in order to maintain battery charge. The engine controller operates the engine using either an optimal fuel cost or a minimum power threshold strategy. Both of these strategies are concerned with the state of charge (SOC) of the battery, not an auxiliary system. The method of the present invention does not optimize battery SOC, as in Brigham. The battery is only considered in the air conditioning case, for example, because the air conditioner cannot be run for an extended period without turning the engine ON, simply because the high load of the air conditioner will deplete the battery SOC. In further contrast to Applicants' invention, as claimed in amended Claim 1 and claims dependent thereon, the threshold values in Brigham are not dependent on whether the present status of the engine is ON or OFF. The Brigham threshold values are desired state of charge values without reference to whether the engine is ON or OFF. Claims 1 and 3-9 as amended recite:

> determining the ON/OFF status of said unit;
>
> if the unit is ON requesting that the unit be maintained ON until the value of an auxiliary system parameter exceeds a unit ON auxiliary system threshold value; and
>
> if the unit is OFF requesting that the unit be turned ON when the value of said parameter falls below a unit OFF auxiliary system threshold value.

The auxiliary system threshold values in Applicants' method are established at blocks 42 or 50, and depend on whether the main power unit is ON or OFF. These unit ON or unit OFF threshold values are compared with an actual auxiliary system parameter value at 44 or 52 respectively. The method as claimed in Claim 1 requires that the unit be maintained ON if the auxiliary system parameter value exceeds a unit ON threshold value and commands that the unit be turned ON if the unit is OFF and the actual auxiliary system parameter falls below

the unit OFF auxiliary system threshold value. So in Applicants' invention, in contrast to Brigham, the threshold value of interest depends upon whether the engine is ON or OFF.

Similarly, Claim 2 as amended recites a window formed by different threshold values that are selected for comparison purposes depending upon whether the main power unit is ON or OFF.

Ibaraki does not supply the missing teaching in Brigham. Indeed, Ibaraki is not concerned with responding to non-propulsive needs of a hybrid vehicle as in the present invention as claimed. Rather Ibaraki is concerned with the propulsive needs of the vehicle, namely whether the load acting of the electric motors is higher or lower than an upper limit. Further, there is no suggestion that the threshold in Ibaraki is one value if the engine is ON and another value if the engine is OFF as in Applicants' invention. As pointed out on page 3 beginning at line 2, in Applicants' invention there is a first threshold to keep a running engine ON, and a second threshold to turn the engine ON from an OFF state.

The arguments made with reference to Claim 1-9 are equally applicable to the system set out in Claims 10-15 and will not be repeated.

Applicants have added new Claims 21 and 22 which are system claims similar to method claims 2 and 3 respectively.

The Examiner has rejected Claims 1-15 under 35 U.S.C. 112, first paragraph. Such rejection is respectfully traversed. The Examiner's attention is directed to Fig. 1 and the discussion thereof beginning on page 4 where it is stated that the controller 20, which may be one or more computers, responds to inputs from sensors such as those shown at 26, 30, 34, and 38 and controls the ON/OFF state of the HPU (engine). All modern vehicles include an engine control computer that interfaces between the operator and sensors to start the engine i.e. turn it ON in response to command inputs and to stop a running engine i.e. turn it OFF in response to other command inputs. The auxiliary systems independently determine if they need the engine to remain ON or, if OFF, to be turned on. This determination is transmitted to the engine controller via a network and the engine controller considers the request along with all the other requests it may see from other systems before changing engine state. This logic overlays existing logic which is well known and is described in detail in the prior art.

As previously discussed in the case of the HVAC, the parameter in that auxiliary system is temperature and the comfort level of the occupant will determine the temperature. As discussed at page 6 beginning at line 25, the upper and lower thresholds are offset by, for example, 2° F, from the desired temperature set by the operator to establish a 4° calibratable window or deadband.

A change in status is requested by setting an engine ON or engine OFF flag in Fig. 2 which is a command to turn the engine ON or OFF respectively. As explained above and in the specification the auxiliary or ancillary systems are system that are not primarily used for propulsion of the vehicle and for that reason are not as crucial for operation of the vehicle as the propulsion system i.e. the motor generator set 16.

In view of these remarks it is submitted that Claims 1-15, 21 and 22 are allowable over the references of record and that the claims and specification conform to 35 U.S.C. 112 and notice of such is respectfully solicited.

It is noticed that the Office Action Summary has a check mark at item 10 implying that the drawings are objected to by the Examiner. It is presumed that this is an erroneous marking since there is no indication by the Examiner of what is objectionable. If this presumption is incorrect the Examiner is requested to identify more precisely what he object to so that Applicants may properly respond.

The Commissioner is hereby authorized to charge any fee deficiency incurred as a result of the filing of this Paper to the deposit account of Applicants' Assignee, Ford Global Technologies, Inc., Deposit Account No. 06-1510. A duplicate copy of the first page of this Paper is enclosed for this purpose.

Respectfully submitted,

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